PHYTOCHEMICALS AND BIOACTIVITIES OF *ARTOCARPUS LANCEIFOLIUS* ROXB AND *ARTOCARPUS MAINGAYI* KING

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Dedicated to

My beloved parents

My sisters and brother

My friends.

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PREFACE

This thesis is the resulted of my own work carried out in the Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia between June 2008 and July 2010 under the supervision of Dr. Shajarahtunnur Jamil. Part of my work describe in this thesis has been reported in the following publications:

1. Noor Safina Sulaiman and Shajarahtunnur Jamil (2009). "Screening of *Artocarpus lanceifolius* for Antibacterial Activity". Second International Conference and Workshops & Regional Fundamental Science Seminar 2009, 2-4 June 2009, Johor Bahru, Malaysia, **1**, 242-244, ISBN : 978-983-9805-73-4

2. Noor Safina Sulaiman, Shajarahtunnur Jamil (2009). "Phytochemicals Studies and Antimicrobial Activities of *Artocarpus lanceifolius*". 2nd Junior Chemist Colloqium 2009, 1-2 July 2009, UNIMAS Sarawak, Malaysia.

ABSTRACT

Phytochemical studies on *Artocarpus lanceifolius* Roxb. and*Artocarpus maingayi* King have successfully isolated seven flavonoids and two plant sterols. Five compounds were successfully isolated from the stem bark of *Artocarpus lanceifolius* which were identified as 9,19-cyclolanost-24-en-3-acetate, cycloartobiloxanthone, artonol B, 7,8-(2,2-dimethylchromeno)-10-(2-hydroxyl-1-methylethyl)-2',4',5',5-tetrahydroxyflavone, and artonin E. Two flavans which were tentatively elucidated as 7,8-(2,2-dimethylchromano)-4',4,5-trihydroxy-2'-methoxyflavan and 8-(11-methyl-11-butenyl)-3,4',5,7-tetrahydroxy-2'-methoxyflavan have been isolated from the leaves of *Artocarpus lanceifolius*. Another two compounds were isolated from the leaves of *Artocarpus maingayi* which were identified as carpachromene, and β-sitosterol. Structures of all compounds were elucidated spectroscopically by Nuclear Magnetic Resonance, Infrared, Ultraviolet Spectroscopies and Mass Spectrometry. Biological activities were carried out on the crude extracts and pure compounds. The antimicrobial testing on the crude extracts and pure compounds were carried out against the Gram-positive bacteria, *Bacillus subtilis* and *Staphylococcus aureus* and Gram-negative bacteria, *Escherichia coli* and *Pseudomonas aeruginosa*. Most of the crude extracts and pure compounds showed significant antimicrobial activity. A pure compound, 7,8-(2, 2-Dimethylchromeno)-10-(2-hydroxyl-1-methylethyl)-2',4',5',5-tetrahydroxyflavone showed most significant antimicrobial activity compared to other isolated compounds and crude extracts with the minimum bactericidal concentration and minimum inhibition concentration value between 31.25 – 62.5 µg/mL. The antioxidant test on the crude extracts and pure compounds from both plant species showed potential free radical scavenger against 2,2-diphenyl-1-picrylhydrazyl. Artonin E exhibited the strongest antioxidant activity with 50% scavenging concentration at 46.9 µg/mL while the ethyl acetate crude extract from the stem bark of *Artocarpus maingayi* showed 50% scavenging concentration at 60.1 µg/mL.

ABSTRAK

Kajian fitokimia ke atas *Artocarpus lanceifolius* Roxb. dan *Artocarpus maingayi* King berjaya mengasingkan tujuh sebatian flavonoid dan dua sebatian sterol tumbuhan. Lima sebatian telah berjaya diasingkan daripada kulit batang *Artocarpus lanceifolius* yang di kenalpasti sebagai 9,19-siklolanos-24-en-3-asetat, sikloartobiloxanton, artonol B, 7,8-(2,2-dimetilkromeno)-10-(2-hidroksil-1-metiletil)-2',4',5',5-tetrahidroksiflavon, dan artonin E. Dua flavan yang dinamakan sebagai 7,8-(2,2-dimetilkromano)-4',4,5-trihidroksi-2'-metoksiflavan dan 8-(11-metil-11-butenil)-3,4',5,7-tetrahidroksi-2'-metoksiflavan telah diasingkan daripada daun *Artocarpus lanceifolius*. Dua lagi sebatian kimia telah diasingkan daripada daun *Artocarpus maingayi* yang dikenalpasti sebagai karpakromen dan *β*-sitosterol. Struktur semua sebatian kimia ini dikenalpasti berdasarkan kepada kajian spektroskopi resonans magnet nukleus, infra merah, spektroskopi ultralembayung dan spektrometri jisim. Kajian aktiviti biologi telah dijalankan ke atas ekstrak mentah dan sebatian tulen. Ujian antibakteria ke atas ekstrak mentah dan sebatian tulen telah dijalankan dengan menggunakan Gram positif, *Bacillus subtilis* dan *Staphylococcus aureus* manakala Gram-negatif, *Escherichia coli* dan *Pseudomonas aeruginosa.* Kebanyakan ekstrak mentah dan sebatian tulen menunjukkan aktiviti antibakteria yang signifikan. Satu sebatian tulen, 7,8-(2,2-dimetilkromeno)-10-(2-hidroksil-1-metiletil)-2',4',5',5-tetrahidroksiflavon menunjukkan aktiviti antibakteria yang paling signifikan berbanding dengan sebatian tulen yang lain dengan nilai kepekatan minimum bakterisidal dan kepekatan minimum perencatan di antara 31.25 hingga 62.5 μg/mL. Ujian antioksidan ke atas ekstrak mentah dan sebatian tulen dari kedua-dua spesies *Artocarpus* menunjukkan keupayaan untuk bertindak sebagai perencat radikal bebas terhadap 2,2-difenil-1-picrylhidrazil. Artonin E menunjukkan aktiviti antioksidan yang terkuat dengan nilai kepekatan untuk merencat 50% radikal pada 46.9 μg/mL, manakala ekstrak mentah etil asetat daripada kulit batang *Artocarpus maingayi* menunjukkan nilai kepekatan untuk merenct 50% radikal pada 60.1 μg/mL.